1. Suppose you have to find an integral of the form \( \int \frac{q(x)}{p(x)} \, dx \), where \( p \) and \( q \) are polynomials.

Suppose \( p(x) = (x - 4)^4(x + 2)(x - 1/2)^2 \).

1A. What is the partial fraction decomposition of \( \frac{q(x)}{p(x)} \) here?

1B. What is the biggest degree \( q(x) \) can have such that polynomial long-division is not required as a necessary first step in finding \( \int \frac{q(x)}{p(x)} \, dx \)?

2. Suppose the partial fraction decomposition of some rational function \( r(x) \) is \( \frac{2}{x - 3} + \frac{4}{(x - 5)^6} \). What is \( \int r(x) \, dx \)?

3. For integration by parts, the mnemonic device “LIATE” is suggested. What do its letters stand for and how is it used?

4. Find \( \int x \cos x \, dx \) using integration by parts. Show all your steps.